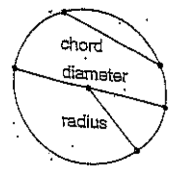
9-1

DATE ______

Student Edition
Pages 446–451

Exploring Circles

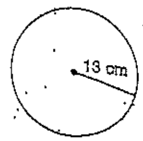
A **circle** is the set of all points in a plane that are a given distance from a given point in the plane called the **center**. Various parts of a circle are labeled in the figure at the right.



The distance around a circle is called the **circumference**.

Circumference of a Circle	If a circle has a circumference of C units and a radius of r units, then $C = 2\pi r$.

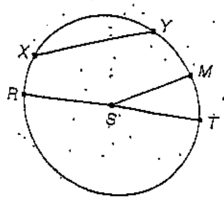
Example: Find the circumference of the circle shown at the right.



$C = 2\pi r$
$C = 2\pi(13)$
$C = 26\pi$
$C \approx 81.7$

The circumference is about 81.7 cm.

Refer to ⊙S for Exercises 1–6.



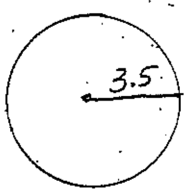
1. Name the center of ⊙S.
2. Name three radii of ⊙S.
3. Name a diameter.
4. Name a chord.
5. If $RT = 8.2$, find SM.
6. Is $\overline{SR} \cong \overline{SM}$? Explain.

In Exercises 7–10, the radius, diameter, or circumference of a circle is given. Find the other measures to the nearest tenth.

7. $r = 7$, $d = \underline{?}$, $C = \underline{?}$
8. $d = 32.4$, $r = \underline{?}$, $C = \underline{?}$
9. $C = 116.5$, $d = \underline{?}$, $r = \underline{?}$
10. $r = 12$, $d = \underline{?}$, $C = \underline{?}$

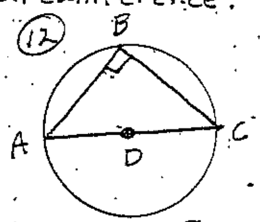
Find the exact circumference.

(11)



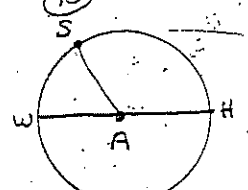
C = ??

(12)



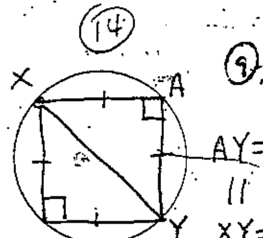
radius = 8
AB = 8 BC = ?

(13)



SA = 15
AH = C = ?

(14)



AY = 11
XY = ?

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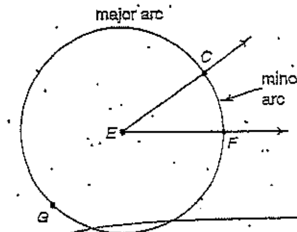
Angles and Arcs

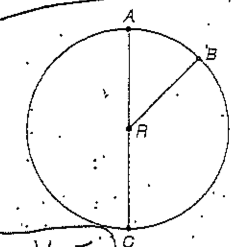
An angle whose vertex is at the center of a circle is called a **central angle**. A central angle separates a circle into two arcs called a **major arc** and a **minor arc**. In the circle at the right, $\angle CEF$ is a central angle. Points C and F and all points of the circle interior to $\angle CEF$ form a minor arc called arc CF. This is written $\widehat{CF}$. Points C and F and all points of the circle exterior to $\angle CEF$ form a major arc called $\widehat{CGF}$.



You can use central angles to find both the degree measure and the length of an arc. The arcs determined by a diameter are called semicircles and have measures of 180.

area of sector: $\frac{CA}{360} \cdot \pi r^2$

Examples: In ⊙R, $m\angle ARB = 42$, $RB = 12$, and $\overline{AC}$ is a diameter.

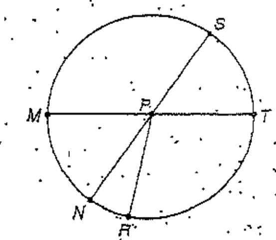


1. Find $m\widehat{AB}$ and $m\widehat{ACB}$.
   Since $\angle ARB$ is a central angle and $m\angle ARB = 42$, then $m\widehat{AB} = 42$.
   $m\widehat{ACB} = 360 - m\widehat{AB} = 360 - 42$ or 318

2. Find the length of $\widehat{AB}$.
   First, find what part of the circle is represented by $\angle ARB$.
   $\frac{42}{360} = \frac{7}{60}$
   So, the length of $\widehat{AB}$ is $\frac{7}{60}$ of the circumference of ⊙R.
   length of $\widehat{AB} = \frac{7}{60}(2\pi r)$
   $= \frac{7}{60}(2\pi)(12)$ or about 8.8 units

arc length = $\frac{CA}{360} \cdot \pi d$

Refer to ⊙P for Exercises 1–8. If $\overline{SN}$ and $\overline{MT}$ are diameters with $m\angle SPT = 51$ and $m\angle NPR = 29$, determine whether each arc is a minor arc, a major arc, or a semicircle. Then find the degree measure of each arc.



1. $m\widehat{NR}$
2. $m\widehat{ST}$
3. $m\widehat{TSR}$
4. $m\widehat{MST}$

If $MT = 15$, find the length of each arc. Round to the nearest tenth.

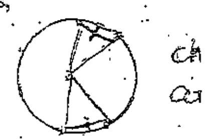
5. $\widehat{NR}$
6. $\widehat{ST}$
7. $\widehat{TSR}$
8. $\widehat{MST}$

(9) Find the area of the sector **contained** ∠NPR

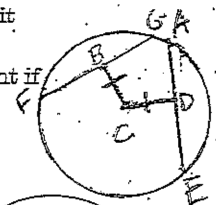
Study Guide 9.3

Arcs and Chords

The following theorems state relationships between arcs, chords, and diameters.



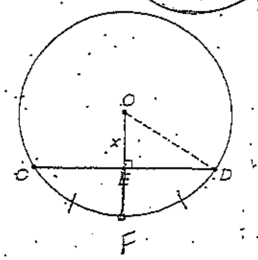
- In a circle or in congruent circles, two minor arcs are congruent if and only if their corresponding chords are congruent.
- In a circle, if a diameter is perpendicular to a chord, then it bisects the chord and its arc.
- In a circle or in congruent circles, two chords are congruent if and only if they are equidistant from the center.



Example: In the circle, O is the center, $OD = 15$, and $CD = 24$. Find x.

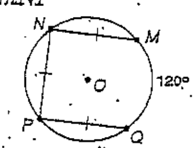
$ED = \frac{1}{2} CD$
$= \frac{1}{2}(24)$
$= 12$

$(OE)^2 + (ED)^2 = (OD)^2$
$x^2 + 12^2 = 15^2$
$x^2 + 144 = 225$
$x^2 = 81$
$x = 9$

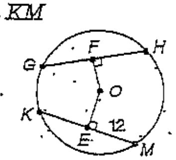


In each circle, O is the center. Find each measure.

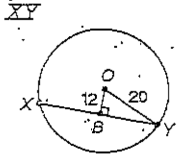
1. $m\widehat{NP}$



2. KM



3. XY



4. Suppose a chord is 20 inches long and is 24 inches from the center of the circle. Find the length of the radius.

5. Suppose a chord of a circle is 5 inches from the center and is 24 inches long. Find the length of the radius.

6. Suppose the diameter of a circle is 30 centimeters long and a chord is 24 centimeters long. Find the distance between the chord and the center of the circle.

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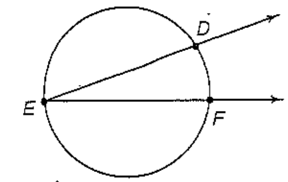
Study Guide

Inscribed Angles

An **inscribed angle** of a circle is an angle whose vertex is on the circle and whose sides contain chords of the circle. We say that $\angle DEF$ *intercepts* $\widehat{DF}$. The following theorems involve inscribed angles.

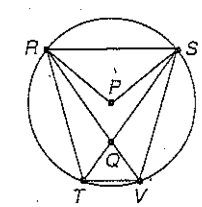


- If an angle is inscribed in a circle, then the measure of the angle equals one-half the measure of its intercepted arc.
- If two inscribed angles of a circle or congruent circles intercept congruent arcs or the same arc, then the angles are congruent.
- If an inscribed angle of a circle intercepts a semicircle, then the angle is a right angle.
- If a quadrilateral is inscribed in a circle, then its opposite angles are supplementary.

Example: In the circle above, find $m\angle DEF$ if $m\widehat{DF} = 28$.
Since $\angle DEF$ is an inscribed angle,
$m\angle DEF = \frac{1}{2} m\widehat{DF} = \frac{1}{2}(28)$ or 14.

In ⊙P,

1. Name the intercepted arc for $\angle RTS$.



2. Name an inscribed angle.

3. Name a central angle.

In ⊙P, $m\widehat{SV}$ = 96 and $m\angle RPS$ = 110. Find each measure. also m∠RVT = 48°

4. $m\angle$ RVS
5. $m\widehat{RS}$
6. $m\angle RTS$
7. m $\widehat{TV}$
8. m $\widehat{RV}$
9. m ∠TQV